SECTION 2

PIPELINE MATERIALS

2-01. General.

The work of this section shall include furnishing and installing all pipe, fittings, joints, together with all material, equipment, labor, transportation, supervision, and other items of expense necessary for or incidental to the installation of pressure water mains and appurtenances in accordance with the plans and specifications.

All materials shall be carefully examined at the job site by the Contractor and District Inspector. The pipe and appurtenances shall be new.

2-02. Scope.

This section defines the materials to be used for pipelines, fittings, joints, and appurtenances.

2-03. Cement Mortar Lined and Coated Steel Pipe.

Cement mortar lined and coated steel pipe (CMLC Pipe) and fittings shall be furnished and installed in accordance with the plans. Pipe, including special fittings, shall be manufactured in accordance with AWWA C201 and C205 and Fed. Spec. SS-P-385 except as further specified in these specifications.

The pipe shall consist of the following component parts: a welded sheet steel or plate steel cylinder with joints formed integrally with the steel cylinder or with the steel joint rings welded to the ends; a five-sixteenth (5/16) inch cement mortar-lining; a one-half (1/2) inch concentric exterior mortar coating; a self-centering bell and spigot joint with a circular pre-formed rubber gasket so designed that the joint will be watertight under all conditions of service.

Steel for cylinders shall be hot-rolled low carbon steel sheets conforming to ASTM A-570 Gr 33. The minimum acceptable yield strength of the steel shall be 33,000 psi, and the minimum wall thickness of any size pipe shall be 10 gauge. Diameter indicated or specified shall be net inside diameter plus or minus one-quarter (1/4) inch after cement mortar-lining. Type II cement shall be used for all mortar-linings and coating.

The exterior of the pipe shall be cement mortar-coated. Cement mortar-coating shall be applied in accordance with AWWA C205 and Fed. Spec. SS-P-385.

Cathodic protection for CMLC Pipe is required as specified.

a) Joints.

(1) Rubber Gasket Joints. Rubber gasket joints shall conform to Fed. Spec. SS-P-385 and be made in accordance with Standard Drawings W-9.

(2) Lap Welded Field Joints. Where indicated on the drawings, lap joints shall comply with AWWA C206. See Standard. Drawing No. W-9

(3) Flanged Ends. Pipe section ends required to be fitted with flanges for special fittings and connections, as shown on the drawings, shall utilize flanges which comply with the requirements of AWWA C207 Class "D" for steel hub flanges. No plate flanges shall be used. All flanged spools shall be positioned and tack-welded in place prior to completing the weld. Flange bolts installed underground shall be either galvanized or cadmium plated, thoroughly coated with NO-OX Grease and wrapped with 8 mil polyethylene sheet. (AWWA C105). Gaskets for flanged joints shall be one sixteenth (1/16) inch thick for up to twenty (20) inch pipe, one-eighth (1/8) inch thick for pipe larger than twenty (20) inches. Rubber gaskets shall not be used for flanged connections. Nuts and bolts shall have hex heads.

b) Fittings for Steel Pipe.

All bends, ells, tees, crosses, reducers, and other fittings for mains twelve (12) inches and smaller shall be either Class 150 or Class 250 Steel Flanged Fittings and shall conform to AWWA Standard C207 and shall be cement mortar lined and coated per AWWA Standard C205; or epoxy lined as approved by the District. Fittings for mains larger than twelve (12) inches may be fabricated in accordance to AWWA Standard C208.

2-04. Ductile Iron Pipe.

Ductile iron pipe shall be designed in accordance with the latest revision of ANSI/AWWA C150/A21.50 for a minimum 250 psi (or project requirements, whichever is greater) rated working pressure plus a 100 psi minimum surge allowance; a 2 to 1 factor of safety.

Ductile iron pipe shall be manufactured in accordance with the latest revision of ANSI/AWWA C151/A21.51. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.

Pipe shall have standard asphaltic pipe coating on the exterior and a double thickness cement mortar lining on the interior in accordance with ANSI/AWWA C104/A21.4, of latest revision.

Manufacturers certificates indicating that pipe has been double lined must be submitted with each pipe delivery.

The class or nominal thickness, net weight without lining, and name of manufacturer shall be clearly marked on each length of pipe. Additionally, the letters "DI" or "Ductile" and the country where cast shall be cast or stamped on the pipe.

a) Joints.

All pipe shall be furnished with either Push-On Type Joints, such as "Tyton" or "Fastite", or Mechanical Joints. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories.

Push on Restraint: When restraining push on joints adjacent to restrained fittings, a harness restraint device shall be used. All harnesses shall have a pressure rating equal to that of the pipe on which it is used through 14". Harness assemblies, including the bolts, shall be manufactured of ductile iron conforming to ASTM A536-80. Harness shall be manufactured by EBBA Iron, Inc. or approved equal.

b) Fittings for Ductile Iron Pipe.

Fittings shall be ductile iron. Ductile iron fittings shall conform to the latest revisions of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings shall have a standard asphaltic coating on the exterior and a double thickness cement mortar lining on the interior in accordance with ANSI/AWWA C14/A21.4, of latest revision.

All fittings and accessories shall be furnished with Mechanical Joints in accordance with ANSI/AWWA C111/A21.11, of latest revision. Retaining glands will be required on all M.J. fittings. The design of all connections between ductile iron pipe and other types of pipe shall be submitted to the District for approval prior to ordering the connection materials.

Mechanical Restrained Joints: Restrained joint fittings shall be provided at all tees, crosses, reducers, bends, caps, plugs, and valves such that the pipe is fully restrained in any one given direction.

These shall meet Uni-B-13 for PVC and be UL/FM approved through 12" for both ductile iron and PVC. The restraint mechanism shall consist of individually activated gripping surfaces to maximize restraint capability.

Twist-off nuts, sized the same as the tee-head bolts, shall be used to insure proper activating of restraining devices. The gland shall be manufactured of ductile iron conforming to ASTM A536-80. The retainer-gland shall have a pressure rating equal to that of the pipe on which it is used through 14" with a minimum safety factor of 2:1. See Standard Drawings W-21, W-22, and W-23. Gland shall be Megalug by EBBA Iron, Inc. or approved equal.

c) Installation of Ductile Iron Pipe and Fittings.

All pipe, fittings, and accessories shall be installed and tested in accordance with the latest revision of AWWA Standard C600. Newly installed ductile iron water mains shall be disinfected in accordance with the latest revision of AWWA Standard C651 prior to placing in service.

d) Connections.

All connections for water service shall be made with malleable iron double strap service saddle as shown on Standard Drawing No. W-1 and W-1A and stated in Section 5-08.

e) Short Pipe Lengths.

Short lengths of pipe no less than one half the length of a standard pipe section shall be used only where necessary to permit the deflections required for abrupt changes of grade or short radius curves. If short lengths of pipe are required to necessitate placing a valve or fitting on station, the short length shall be installed a minimum of one full pipe length away from said fitting, otherwise joint restraints will be required.

2-05. Polyvinyl Chloride (PVC) Pipe.

Polyvinyl Chloride (PVC) pipe and joints shall be designed and manufactured in accordance with ANSI/AWWA Standard C900, latest revision, and Appendix A of said Standard. All pipe shall have a dimension ratio (DR) as shown on the approved plans. If the DR is not specified, DR 18 shall be installed.

Pipe markings shall be in accordance with ANSI/AWWA Standard C900 including the seal (mark) of the testing agency which verified the suitability of the pipe material for potable-water service. An affidavit of compliance to specifications shall be provided for all delivered materials.

a) Fittings for Polyvinyl Chloride (PVC) Pipe.

Fittings shall be ductile-iron and shall conform to the latest revision of either ANSI/AWWA Standard C110/A21.10 or ANSI/AWWA C153/A21.53 Class 350. Fitting shall be cement mortar lined per ANSI/AWWA Standard C104/A21.5.

All fittings and accessories shall be furnished with mechanical joints in accordance with the latest revision of ANSI/AWWA Standard C111/A21.11. All fitting joints shall have restraining devices in accordance with the latest revision of Uni-Bell Standard UNI-B-13.

The design of all connections between Polyvinyl Chloride (PVC) Pipe and other types of pipe shall be submitted to the District for approval prior to ordering the connection materials.

Mechanical Restrained Joints: Restrained joint fittings shall be provided at all tees, crosses, reducers, bends, caps, plugs, and valves such that the pipe is fully restrained in any one given direction.

These shall meet Uni-B-13 for PVC and be UL/FM approved through 12" for both ductile iron and PVC. The restraint mechanism shall consist of individually activated gripping surfaces to maximize restraint capability. Twist-off nuts, sized the same as the tee-head bolts, shall be used to insure proper activating of restraining devices. The gland shall be manufactured of ductile iron conforming to ASTM A536-80. The retainer-gland shall have a pressure rating equal to that of the pipe on which it is used through 14" with a minimum safety factor of 2:1. See Standard Drawings W-18, W-19, and W-20. Gland shall be Megalug by EBBA Iron, Inc. or approved equal.

b) Curves and Bends.

Changes in alignment and grade may be made by deflecting the pipe units at joints as provided herein and pipe units shorter than standard length may be required. Pipe joints shall not be deflected more than half of the manufacturer's recommendation. Pipe with factory installed couplings shall be deflected not more than half the allowable deflection for field installed couplings.

If necessary, alternate methods of providing curves in pipelines other than shown on the plans may be submitted to the District for approval.

Where no radius is given at minor Points of Intersection, the deflection angle shall be accomplished by making the deflection at one or more couplings as required.

Short lengths of pipe no less than one half the length of a standard pipe section shall be used only where necessary to permit the deflections required for abrupt changes of grade or short radius curves. If short lengths of pipe are required to necessitate placing a valve or fitting on station, the short length shall be installed a minimum of one full pipe length away from said fitting, otherwise joint restraints will be required.

c) Identification Wire.

Identification wire shall be installed with all Polyvinyl Chloride (PVC) Pipe. The wire shall be insulated 14 gauge copper and shall be installed as detailed on Standard Drawing No. W-8. The wire shall be placed on the top of the pipe on the centerline of the pipe. The wire shall be fastened securely at four (4) foot intervals and at each joint or fitting with an eight (8) inch length of two (2) inch wide duct tape or other approved method. All splices to be encapsulated with rubber sealing tape per Duet Industries or approved equal and shall be in hydrant pads where possible. See Standard Drawing W-8.

The wire shall be tested prior to issuance of Fire System Activation Letter to ensure continuity. Testing must be witnessed by the District Inspector.

d) Connections.

All connections for water service shall be made with a Jones Model #J-969 or approved equal bronze service saddle set as shown on Standard Drawing No. W-1 and W-1A and stated in section 5-07.

e) Underground Marking Tape.

Underground marking tape shall be installed with all PVC pipe. The tape shall be placed one (1) foot above the pipe with the lettering facing up. It shall be six (6) inches wide, blue in color, with the following wording: "Caution -Water Line Buried Below", stretchable, and constructed of six (6) ply high-density copolymer. The tape shall be Terra Tape Extra Stretch 540 or approved equal meeting the requirements listed above.

f) Push on Restraint:

When restraining push on joints adjacent to restrained fittings, a harness restraint device shall be used. All harnesses shall have a pressure rating equal to that of the pipe on which it is used through 14". Harness assemblies, including the bolts, shall be manufactured of ductile iron conforming to ASTM A536-80. Harness shall be manufactured by EBBA Iron, Inc. or approved equal.